TABLE NO □□□

STUDENT ID NO

MULTIMEDIA UNIVERSITY □□□□□□□□□□

SUBJECT CODE ____________________

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

TSE3151 – SOFTWARE DESIGN

(All sections / Groups)

12 MARCH 2020
9:00 am – 11:00 am
(2 Hours)

Examiner 1 Signature: ____________________

Examiner 2 Signature: ____________________

Examiner 3 Signature: ____________________

Question	Mark
A	
B	
C	
D	
Total	

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 11 printed pages (including cover page) with 4 Sections only.

2. Attempt **ALL** questions in **SECTION A, SECTION B, SECTION C and SECTION D.** The distribution of the marks for each question is given.

3. Please write all your answers **CLEARLY** in the specific answer box provided for each question. Submit this question paper at the end of the examination.

Attempt ALL questions in SECTION A, B, C and D.

Section A (12.5 marks)

Consider the following Food example program design with “Decorator” Design Pattern.

```
interface Food
    {  float getPrice() ;
       String getDescription() ;
    }
class Pizza implements Food
    {  float getPrice()
           { return 50 ; }
       String getDescription()
           { return “Regular Pizza” ; }
    }
class Addition implements Food
    {  Food f ;
       Addition(Food f)
           { this.f = f ; }
       float getPrice()
           { return f.getPrice() ; }
       String getDescription()
           { return f.getDescription() ; }
    }
class PlusOnion extends Addition
    { PlusOnion(Food f)
           { super(f) ; }
      float getPrice()
           { return super.getPrice() + 5 ; }
      String getDescription()
           { return super.getDescription() + “, with Onion”); }
    }
class PlusCheese extends Addition
    { PlusCheese(Food f)
           { super(f) ; }
      float getPrice()
           { return super.getPrice() + 7 ; }
      String getDescription()
           { return super.getDescription() + “, with Cheese”); }
    }
// Etc.
    ... // In the program
    Food f = new PlusOnion(new PlusCheese(new Pizza())) ;
    ...
    System.out.println(“You bought : “+f.getDescription()) ;
    System.out.println(“Price in Shekels is : “+f.getPrice()) ;
```

Continued...

Among the name in the **Decorator** Design Pattern (DP) include *Component*, *ConcreteComponent*, *operation( )*, *Decorator*, *componentAggregationVariable*, ConcreteDecoratorA, and *ConcreteDecoratorB*.

Based on the above context, answer the following questions Q-A1 to Q-A2:

A1. Write a table to show the mapping of **Decorator** DP to the above Food example program.

(4 marks)

Continued…

A2. Draw a class diagram for the typical Decorator design pattern. Among the name in the Decorator design pattern include *Component*, *ConcreteComponent*, *operation( )*, *Decorator*, *componentAggregationVariable*, ConcreteDecoratorA with *addedState* variable or attribute, and *ConcreteDecoratorB* with *addedBehavior()* method.

(3.5 marks)

Continued…

A3. Draw a class diagram for the typical **Adapter DP** with the name in DP of *Adaptee*, *adapteeMethod( )*, *Target*, *targetMethod( )*, *Adapter*, *adapteeAggregationVariable*, and *Client*.

(5 marks)

Continued…

B2a. Designing software is made more complex because we may be designing a sequence of actions. Design for at least **FOUR** steps of instructions for making coffee with a coffee maker and coffee beans.

(4 marks)

B2b. Consider the major problems that might arise (examples: no water in the kettle, outdated coffee ground beans, and so on). Write **FIVE** requirements or constraints on how you would reorganize the instructions in your answers to question B2a above, for these exceptional situations so that they do not obscure the original design.

(2.5 marks)

Continued…

Section C (12.5 marks)

C1. Consider a physical building electrical grid design used with a software aided design system. Describe the following:

C1a. **THREE (3)** viewpoints **with explanations on each viewpoint**, that might be needed in order to provide a full design description,

C1b. **FOUR (4)** representations with examples that could be used for these design descriptions.

(3 + 2 marks)

C2. Suggest how you might represent the following viewpoints using in turn: text on its own; and a diagram on the program units (procedures) that make use of a particular data type in a program.

(2.5 marks)

Continued…

C3. Consider a home surveillance system may want to know if the system will notify the user when it enters a degraded mode of operation (for example, a motion sensor fails) or whether the mechanism that enforces user-defined access controls to the surveillance footage stored remotely in a cloud data center will work as advertised.

In this example, the design goal would be to collect information about the system health-and-status monitoring, altering, and security access-control subsystems but only to the extent necessary to support the tools, techniques, workflows, and standards used in the assessment.

Based on the above scenario, answer questions Q-C3a to Q-C3b:

C3a. Explain **TWO** reasons in favour of standardizing any particular form of design description.

(2 marks)

C3b. Explain **THREE** reasons against standardizing the same form of description.

(3 marks)

Continued...

Section D (12.5 marks)

Consider the Internet of Things (IoT), which refers to network-enabled technologies, including mobile and wearable devices, which are capable of sensing and actuation as well as interaction and communication with other similar devices over the Internet. The IoT is profoundly redefining the way we create, consume, and share information. Ordinary citizens increasingly use these technologies to track their sleep, food intake, activity, vital signs, and other physiological statuses. This activity is complemented by IoT systems that continuously collect and process environment-related data that has a bearing on human health.

IoT data itself is not adequate to understand an individual's health and associated aspects of wellbeing and fitness; it is usually necessary to look at that individual's clinical record and behavioral information, as well as social and environmental information affecting that individual. Interpreting how well a patient is doing requires looking at his adherence to respective health objectives, application of relevant clinical knowledge and desired outcomes, such as the patient's preference for quality of life versus longevity and expert knowledge.

Augmented Personalized Healthcare (APH) system is a vision for exploiting the extensive variety of relevant data and medical knowledge using artificial intelligence (AI) techniques to extend and enhance human health and well-being. It anticipates the use of physical, cyber, and social data obtained from wearables and IoT devices; clinical information including electronic medical records (EMRs); mobile applications supporting targeted interactions and engagement with the patients; and web-based information including web services (such as those providing health-relevant data on allergens and air quality), social media (such as posts by patients with similar concerns and conditions), and extensive online knowledge bases of clinical practice and medicine. Data can be collected at the personal, public, and population levels, and be combined with knowledge that affects human health. Augmentation refers to aggregating this data and converting into actionable information that can improve health-related outcomes through better and more timely decisions. This embodiment of APH is an entirely new approach to human healthcare in comparison with the current episodic system of periodic care primarily centered around healthcare establishments (such as clinics, hospitals, and labs).

Based on the above context, answer the following questions Q-D1 to Q-D3:

D1. Explain how **Abstract Factory** DP able to provide the solution to the above APH (Augmented Personalized Healthcare) software system.

(3 marks)

Continued...

D2. Draw a class diagram for the **typical Abstract Factory DP** with the name in DP of ***AbstractFactory***, ***createProductA()***, ***createProductB()***, ***ConcreteFactory1***, ***ConcreteFactory2***, ***AbstractProductA***, ***ProductA2***, ***ProductA1***, ***AbstractProductB***, ***ProductB2***, ***ProductB1***, and ***Client***. Note that this typical DP can be used to establish the mapping to the actual components of the software system when necessary.

(8.5 marks)

D3. Design patterns are a form of reuse. What are you reusing in design patterns for the abovementioned Augmented Personalized Healthcare (APH) system?

(1 mark)

End of Paper